



Describing product experience in different languages: The role of sensory modalities

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ABSTRACT

People describe their product experiences using adjectives that can be divided into three groups: sensory descriptors (e.g., hard, red, noisy); symbolic descriptors (e.g., interesting, expensive, modern); and affective descriptors (e.g., pleasant, beautiful). All product experiences rely on information from sensory modalities. We developed a questionnaire approach to quantify the relative importance of the five sensory modalities for various descriptors of product experience. The approach was used in two studies that employed Dutch and Russian participants. The results demonstrate that the importance of a sensory modality differs for various groups of descriptors. Most symbolic descriptors demonstrated strong visual dominance. Affective descriptors were equally related to all sensory modalities. Sensory descriptors showed significant cross-cultural differences. The latter result can be explained by the different associations between literal and metaphorical meanings of sensory adjectives in different languages.

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1. Introduction

When people interact with products, they receive information through all the different senses. This sensory information is processed in the brain and contributes to the overall product experience that people are aware of and can describe verbally. In describing their experience, people usually use adjectives that reflect sensory properties (e.g., warm, solid, red, loud), adjectives that refer to symbolic properties (e.g., elegant, expensive, modern), and affective evaluations (e.g., good, bad, beautiful, ugly) of the product (see [Hekkert and Schifferstein, 2008](#)).

All descriptions of product experiences ultimately rely on sensory inputs derived from the product. Nonetheless, information from some sensory modalities may be more important for describing certain product experiences than others. We define “sensory importance” as the relative contribution of each sensory modality to the description of a particular product experience. The dominant sensory modality is the modality that has the largest effect on the specific description. In this research we wonder what the role of the senses is in the description of product experiences through different types of adjectives.

1.1. Factors affecting sensory dominance

A general and popular belief seems to be that vision is the dominant sensory modality in everyday experience. When people are asked which sensory modality they would miss most if they lost it, the majority is likely to indicate vision ([Fiore and Kimle, 1997](#); [Schifferstein, 2006](#)). In addition, when people are asked to describe objects, they primarily use adjectives that refer to the visual (60%) or tactual (32%) modalities ([Stadtlander and Murdoch, 2000](#)).

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However, vision is not the dominant modality in the interaction with all products. In a study using consumers' self-reported importances, participants reported that they found one of the other sensory modalities more important than vision during product usage for about half of the products (Schifferstein, 2006). For example, for a computer mouse the tactual characteristics were most important, for a vacuum cleaner the sound it made, for a cleaning product its smell, and for a soft drink its taste. The relative importance of a modality may depend on various aspects, such as the availability of sources of sensory stimulation, the degree of variation in sensory stimulation over various products, the usefulness of the sensory information during functional use, the proportion of time a modality is used actively, and the role of the stimulation in enjoying the product. Hence, the roles of the modalities depend not only on whether a certain type of sensory information is present, but also on whether the information is perceived, how it is processed, and how people react to it emotionally.

Culture may play a role in determining the importance of a sensory modality. Culture has been shown to influence a large variety of behaviours across many diverse disciplines, including consumer behaviour (see Hofstede, 2001). Schifferstein (2006) suggested that the visual system is regarded dominant, because it plays a significant role in many daily activities. The importance of vision in Western societies may have increased over time due to the products that were created, such as books, television, and computers that require major input from the visual modality. McLuhan (1961) believed that the nature of media by which people communicate affects the ratio of their senses. For example, the alphabet stresses the sense of sight, which in turn causes people to think in linear, objective terms. He argued that Europeans and North Americans live in the visual mode, while for native Africans and other non-literate societies the auditory modality is dominant. However, anthropological data suggest that significant diversity exists in sensory dominance among non-literal peoples. Classen (2005) describes three non-literal societies that have three different dominant sensory modalities: temperature is the most important sensory property for the Tzotzil of Mexico, smell for the Ongee of the Little Andaman Island, and vision for the Desana of Columbia.

1.2. *Can language influence product experience?*

Language is one of the core components of any culture. It is central to communication and closely related to thought. Much of human cultural heritage is encapsulated in semantic concepts packed into words (Levinson and Jaisson, 2006). Through language individuals have access to the large accumulation of cultural ideas, practices and technology which constitute a distinct cultural tradition (Gumperz and Levinson, 1996). The learning of natural languages is probably the most complex cognitive task that humans routinely undertake and the major pressure for brain evolution in our species (Byrne and Whiten, 1988).

Languages differ fundamentally in their semantic categories—the concepts built into their grammars and lexicons. It is quite difficult to find any exact cross-linguistic matches between linguistically coded concepts (Levinson and Meira, 2003). To what extent are our ideas and concepts actually embodied in language? A proposal of linguistic relativity emphasizes a distinctive role of language in interpreting experience and influencing thought (Gumperz and Levinson, 1996). The idea that thought is shaped by language is most commonly associated with the writings of Benjamin Lee Whorf. Whorf (1956) impressed by linguistic diversity, proposed that the categories and distinctions of each language determine a way of perceiving, analyzing, and acting in the world. In recent years, some studies have claimed evidence that language indeed has an important influence on thinking (e.g. Boroditsky, 2001; Bowerman, 1996; Davidoff et al., 1999; Gentner and Imai, 1997; Levinson, 1996; Lucy, 1992), while others have reported evidence to the contrary (e.g. Heider, 1972; Malt et al., 1999; Li and Gleitman, 2002).

Experimental evidence has reopened the debate about the extent to which language influences cognitive processing of sensory information. Extensive research has been done in domains such as the experience of space (Levinson, 1996; Li and Gleitman, 2002; Majid et al., 2004), colour (Gilbert et al., 2006; Kay and Kempton, 1984; Robertson et al., 2000), number (Gordon, 2004; Gelman and Gallistel, 2004; Pica et al., 2004), and time (Boroditsky, 2001; Chen, 2007; January and Kako, 2007; Núñez and Sweetser, 2006).

As regards the time domain, speakers of different languages might talk about the future as if it lies ahead of us (in English), behind us (in Aymara), or below us (in Mandarin Chinese). Behavioural studies suggest that speakers of languages that use different spatiotemporal metaphors may think differently about time. Indeed, Mandarin speakers were faster to confirm that March comes earlier than April if they had just seen a vertical array of objects than if they had just seen a horizontal array. The reverse was true for English speakers (Boroditsky, 2001; Núñez and Sweetser, 2006).

Dramatic cross-linguistic differences have also been reported for the domain of space (Levinson, 1996). Whereas most languages (e.g. English, Dutch) rely heavily on relative spatial terms to describe the locations of objects (e.g. left/right, front/back), Tzeltal (a Mayan language) relies primarily on absolute reference (similar to the north/south system). In experiments with spatial tasks Dutch and Tzeltal speakers saw an arrow pointing either to the right (north) or to the left (south). They were then rotated 180° and were asked to identify the arrow “like the one they saw before”. Dutch speakers overwhelmingly chose the ‘relative’ solution, while Tzeltal speakers overwhelmingly chose the ‘absolute’ solution. Furthermore, speakers of languages preferring absolute coordinates show more accurate skills when asked to indicate the direction of familiar locations from an unfamiliar site (Levinson, 1996), suggesting that the differences may have everyday correlates.

Studies on occupational accidents in Finland give another example of everyday consequences of language differences. Occupational accident rates are substantially lower in Sweden than in Finland, and also among the Swedish-speaking minority within Finland, despite working in the same regions with similar laws and regulations (Salminen and Hiltunen,

1995; Johansson and Strømnes, 1995). Researchers explained this difference by structural differences between Swedish and Finnish. Swedish prepositions can be represented in terms of vector geometry in a three-dimensional space, whereas Finnish cases can be represented in a two-dimensional space coupled with a third dimension of time (Strømnes, 1973, 1974). The researchers suggest that the Finns organize the workplace in a way that favours the individual worker over the temporal organization of the overall production process. Lack of attention to the overall temporal organization leads to frequent disruptions and accidents (Johansson and Salminen, 1996; Johansson and Strømnes, 1995).

Studies have also shown that language characteristics (such as grammatical gender) can influence product experience (Lucy and Gaskins, 2001; Boroditsky, 2001; Boroditsky et al., 2003). For example, when German speakers were asked to describe a 'key' (a word masculine in German and feminine in Spanish), they were more likely to use words like 'hard, heavy, jagged, metal, serrated, and useful', while Spanish speakers were more likely to say 'golden, intricate, little, lovely, shiny, and tiny'. On the other hand, to describe a 'bridge' (a word feminine in German and masculine in Spanish), German speakers referred to it as 'beautiful, elegant, fragile, peaceful, pretty, and slender', while Spanish speakers more often said 'big, dangerous, long, strong, sturdy, and towering'.

Schmitt et al. (1994) proposed that structural differences between the Chinese and English language affect mental representations which, in turn, influence consumer memory of verbal information. The authors showed that unaided brand recall was differentially affected in Chinese and English when it was spoken compared to when it was written. Chinese brand attitudes were primarily affected by the match between script associations and brand associations, but brand attitudes of English names were primarily affected by the match between sound associations and brand associations (Pan and Schmitt, 1996). Furthermore, how much consumers like a brand name translation can depend on whether that name depicts phonological or semantic characteristics of the original name (Pan and Schmitt, 1996).

Schmitt and Zhang (1998) and Zhang and Schmitt (1998) found that structural aspects of a language can affect one of the most basic aspects of consumer behaviour: categorization of products. They demonstrated how classifiers, a widespread lexical and syntactical phenomenon in the Chinese, Japanese, and Thai languages, and almost non-existent in Indo-European languages such as English, German and Spanish, affect the perceived similarity between objects, attribute accessibility, and concept organization. They also demonstrated the impact of classifier-based schemata on inferences about product features and provided evidence of the effect of classifiers on judgment and choice.

1.3. Linguistic descriptions of sensory characteristics

In the present study, we investigate language differences in descriptions of product experience. We assume that language effects may depend on the type of adjectives used to describe product experience. Some aspects of product experience seem to be uniquely unimodal: hue can only be experienced by sight, tickle can only be felt by touch, and pitch can only be differentiated by audition. Nevertheless, our perceptual experience of the world is richly multimodal (Stein and Meredith, 1993). People are able to extract information derived from one sensory modality and use it in another. People can, for example, know a shape by touch and identify it correctly by sight. Furthermore, people are able to integrate the impressions generated by different sensory modalities into a unified, rich percept. In addition, sensory terms that describe physical properties of things (such as 'warm' and 'cold') also describe some psychological qualities. Different languages such as ancient Greek, Thai, Chinese and Hebrew possess some morphemes that designate physical–psychological pairings identical with those found in English (Asch, 1955).

Human language partly operates through metaphors. Metaphors can structure people's thoughts, govern their activities, and enable their reasoning from the familiar to the unfamiliar (Lakoff and Johnson, 1980, 1999; Rein and Schön, 1977). Metaphors often refer to sensory phenomena. Good ideas are described as 'brilliant,' pleasant dreams as 'sweet,' important topics as 'hot,' and bright colours as 'loud.' Gallup and Cameron (1992) argued that English and other European languages mainly use visual terms as metaphors to describe or capture mental events ('as illustrated by,' 'reflect on that,' 'shed some light,' 'a clear explanation') by referring to human evolutionary heritage and the anatomical structure of the brain. Compared with other sensory input, a disproportionate amount of brain tissue is devoted to the processing of visual information (Van Essen et al., 1990).

Because people do not rely on each of the five senses equally and use some sensory modalities more often than others, it makes sense that certain sensory modalities have greater frequency in linguistic representation. Based on data from 53 languages from all parts of the world, Viberg has shown that the large amount of polysemy with respect to the sense modalities for verbs is constrained by a hierarchy which gives the most prominent place to vision and the least prominent to smell and taste (Viberg, 1984). The hierarchy can be presented as follows: sight > hearing > touch > smell, taste. According to this hierarchy, 'a verb having a basic meaning belonging to a sense modality higher (to the left) in the hierarchy can get an extended meaning that covers some (or all) of the sense modalities lower in the hierarchy' (pp. 136–137). A sense that holds the top position has the highest number of polysemic patterns and also the highest number of lexemes at the level below the basic one. Viberg concludes that the verbs of perception, especially 'see', have an extensive range of cognitive meanings, and that 'know' and 'see' are covered by the same word in a number of languages. For example, in English it is acceptable to say any of the following: (1) "I listened to the voice to see if I could recognize it." (2) "I felt his hand to see how hot it was." (3) "I tasted the soup to see whether it was ready." (4) "I smelled the air to see how fresh it was." Miller and Johnson-Laird (1976) also acknowledge the startling complexity of the verb 'see' and link it to the conceptual complexity of visual processes. However, none of these linguists considers the extension of the meaning of sensory verbs to be metaphorical.

English verbs of perception and their complex polysemous structure and etymology have also been studied by Sweetser (1990). Unlike Viberg, Sweetser argues that the connection between the domain of external, physical sensation on the one hand and abstract, cognitive states, on the other hand, is metaphorical in nature. According to the cognitive theory of metaphor, verbal metaphors, including conventional expressions based on metaphor, reflect underlying conceptual metaphors in which people conceptualize vague, abstract domains of knowledge (such as time, causation, ideas, and emotions) in terms of more specific, familiar, and concrete knowledge (Gibbs, 1994). Human thinking is organized from simple to complex, and the basic sensory experience (source domain) is used to understand more abstract phenomena (target domain). Sweetser suggests three reasons for the prominent relationship between vision (as a source domain) and knowledge (as a target domain): (1) The focusing ability of the sense of vision enables people to pick up one stimulus from many, and, together with its intentionality and directionality, differentiates it from the other senses. (2) Vision is our primary source of objective data about the world. Visual features are the most marked in children's early categorization, thus form an important source for concept formation. Vision provides data from a distance, which through metaphoric transfer become a characteristic of objectivity in the intellectual domain. (3) Vision is identical for different people who can take the same point of view.

Some authors argue that visual metaphors for mental processes are of relatively recent date. The salient position vision occupies in conceptualization of the intellect is not shared by all cultures or even present in older stages in the Indo-European culture (Ibarretxe-Antuñano, 2008). Classen (1993) suggests that sight-based words such as bright, brilliant, and lucid have been used to mean intelligent only since the Enlightenment period, "perhaps in consequence of the general rise of visualism at that time" (p. 58). Many more terms of thought are tactile or kinaesthetic, such as apprehend, comprehend, conceive, grasp, ruminate and understand. "Thought is, or was, experienced primarily in terms of touch [...]. Knowing was less like seeing than like holding" (Classen, 1993:58).

Auditory verbs rarely serve as metaphors for thought or intelligence in English, perhaps because hearing is conceived of as a passive sense, receiving information but not probing it. The main function of hearing is communication, and it is the major path of interpersonal influence. Therefore, hearing is associated with obedience and emotional receptivity ('being deaf to someone's plea') rather than with intelligence (Sweetser, 1990). However, languages differ in the metaphorical use of auditory verbs. For example, Evans and Wilkins (2000) showed that Australian languages recruit verbs of cognition like 'think' and 'know' from 'hear', not from 'see'. Suyá Indians of Brazil use the same verb for 'listen', 'understand', and 'know' (Seeger, 1975), and in Russian the word *понимать* ('understand') has the same root as *внимать* ('listen carefully').

Describing the semantics of three Russian perception verbs, *воспринимать* ('perceive'), *ощущать* ('sense'), and *чувствовать* ('feel'), Lordanskaja (1979) notes that Russian semantics reflects the 'naive' conception of smelling, feeling, and taste as opposed to sight and hearing. The verb *воспринимать* ('perceive') can stand for any mental ability, including reason, sight, and hearing, while the verbs *ощущать* ('sense') and *чувствовать* ('feel') stand for olfaction, touch, taste, kinesthetic and other internal senses. In addition, *чувствовать* ('feel') can be metaphorically used for intuition, instinct and the unconscious mind. Optical or acoustic perception cannot be called *ощущать* or *чувствовать* in Russian, which coincides with psychological theories that consider sight and hearing to be the most sophisticated forms of perception, in contrast to the other three senses.

A lot of perceptual (or sensory) adjectives, such as sharp, dull (touch), sweet, sour (taste), loud, and quiet (sound), often extend their meaning from one basic, or prototypical, sense modality to one or more secondary modalities. From Ullmann's (1957) work based on an investigation of 19th century poetry the following two hierarchies can be derived: touch > taste > scent and touch > sound, sight. Out of a total of 2009 transfers, he found 1665 upward transfers (from left to right) and only 344 downward transfers. The largest number of transactions occurred between touch and sound.

Ullmann's study mainly deals with literary metaphor, and many of the examples he provides are certainly not part of established usage. Williams (1976) looked at historical changes of English adjectives referring to sensory experience in English dictionaries. He found that such adjectives transferred according to a hierarchy that accords well with the one presented by Ullmann. Williams noticed that metaphorical transfers, with relatively few exceptions, go in one direction. That is, a touch word may transfer to taste ('hot') or directly to sound ('sharp') or sight ('soft'). A taste word may transfer to smell or to sound ('sour smell', 'sweet music'), and sight words may transfer to sound and vice versa ('loud colour', 'clear sound'). Williams assumes the hierarchy to be biologically based. The transfers go from the physiologically least differentiating, evolutionary and ontogenetically primitive sensory modalities to the most differentiating, most advanced.

It is puzzling that the hierarchies of adjectives and verbs differ substantially. While the verb "to see" can have many non-visual meanings, the touch-related adjectives can transfer their meanings to the majority of other sensory domains. The reason behind this discrepancy may be that transfer of meaning in verbs and adjectives refer to different areas of human experience. Lehrer (1978) suggests that the transfer of meaning in adjectives is mainly based on the general experiential dimensions of intensity and evaluation. In the early 1950s, Osgood asked participants to evaluate different concepts and objects on a number of bipolar scales based on semantic opposites, such as good–bad, soft–hard, fast–slow, clean–dirty, valuable–worthless, fair–unfair, and so on (Osgood et al., 1957). Osgood called them "semantic differential" scales, because they differentiated personal attitudes based on a subjective understanding of the connotative meanings of words. Factor analysis of the responses generally yielded three dimensions: Evaluation or valence (e.g. good–bad, pleasant–unpleasant), Activity (e.g. fast–slow, stimulating–relaxing, lively–quiet), and Potency (e.g. weak–strong, gentle–tough, persistent–accommodating). Evaluation (valence) and Activity (arousal) are often seen as the two primary dimensions for emotional experiences (see, e.g., Feldman Barrett and Russell, 1998). According to Lehrer (1978), they may also be the most important dimensions for the transfer of meaning in sensory adjectives.

The sense of touch has always been related to the field of emotions. Expressions such as “I’m deeply touched” or “touching words” are widely used in English. Already in 1921, Hans Kurath classified sense perception with respect to emotions and stated how “the kinaesthetic, the visceral, and the tactual perceptions have a relatively stronger tone than those of hearing and especially of sight, the taste-smell perceptions taking a middle ground” (p. 39). Kurath explained this transfer of meaning from sense perception to emotion on the basis of the similarity of feelings that both domains share. This connection can also be explained by the etymology. Buck (1949) points out that the general word in West Germanic languages for ‘feel’ refers not only to tactile perception but also to emotions, even in the earliest periods of the languages.

Viberg (1984) argues that, unlike the hierarchy of sensory adjectives, which is probably based on the Evaluation and Activity dimensions, the hierarchy of sensory verbs is based on another experiential dimension, related to the degree of certainty. For example, the statement “I saw that the building was huge” implies more certainty than “I heard that the building was huge”, which depends on the reliability of the source of information. The statement “I feel that Mary has doubts about her marriage” is the least certain. The dimension of certainty is most relevant for verbs connected to sight, hearing, and touch.

For the verbs connected to taste and smell the evaluative component seems dominant (‘to taste freedom’, ‘to smell treason’). There are relatively few olfactory terms in English and most of them refer to bad smells. Metaphorical meanings for smell verbs include the detection of bad characteristics, as in “Something about his testimony stinks” (Caplan, 1973; Viberg, 1984; Sweetser, 1990) and to suspect, to guess, to sense something intuitively, as in “She could smell money, power, victory” (Ibarretxe-Antuñano, 1999). While the connotation of ‘smelly’ is often negative, that of ‘tasty’ is positive, which Classen explains by the fact that people are confronted with foul smells more often than with foul tastes: “We can choose our food, but we cannot as readily close our noses to bad smells” (p. 53). Taste figuratively means ‘judgment of what is beautiful’ and is, therefore, characterized as a sense of aesthetic discrimination. This relation between taste and preferences is very common cross-linguistically (Buck, 1949).

1.4. Present research

The present research aims to find out which sensory modalities are dominant for different descriptors of product experiences. We assume that for sensory descriptors of product experience the corresponding sensory modalities will be dominant, such as taste for ‘sweet’, touch for ‘hard’, and audition for ‘loud’. If an adjective has both a literal and a figurative meaning, we expect the link with the modality corresponding to the literal meaning to be stronger, because this is the original meaning. As an original source is likely to have a stronger effect than a derivative, we expect the original modality to have a stronger connection to the descriptor than any of the modalities that are involved in the figurative meanings. Symbolic and affective descriptors of product experience are likely to be multisensory, but possibly one or more sensory modalities play a more dominant role in assessing how interesting, modern, exciting or funny people find a particular product.

In Study 1 we try to find experience descriptors that are related to all sensory modalities to the same degree and are not biased towards any modality. According to our assumption, we expect to find these among the symbolic and affective descriptors. In Study 2 we look for adjectives that are mainly related to a single sensory modality. We expect to find these mostly among the sensory descriptors. In Study 2 we also test whether a difference exists between the sensory dependence of the three types of product experience descriptors (sensory, symbolic and affective) for participants with different native languages.

2. Study 1: selecting a sensory neutral experience

The aim of this study was to find product experience descriptions that are not biased towards any of the modalities. We assumed that concrete, sensory descriptors are likely to refer to a single sensory modality. An adjective that can be used in a literal sense for one modality and in a metaphorical sense for other modalities (e.g., rough, heavy) is likely to be dominated by the modality for which the descriptor has a literal meaning (i.e., touch). Therefore, we were looking for adjectives that were abstract and had a meaning that could be applied to the same degree to all sensory modalities.

To develop a new index for evaluating aesthetic impressions in close relation to human modalities, Suzuki and Gyoba (2001) introduced the sensory relevance coefficient. This coefficient indicates the extent to which pairs of adjectives are related to sensory modalities. For each adjective pair, the coefficient reflects the proportion of participants that indicated that a particular modality was related most to this adjective. Examples of adjective pairs that were judged to be primarily related to visual perception were beautiful–ugly (0.95), gay–sober (0.99), and clear–cloudy (0.86). Primarily tactual were wet–dry (0.91), soft–hard (0.96), cold–warm (0.91), and smooth–rough (0.78). The only adjective pair that was mainly auditory was living–quiet (0.83). No adjective pairs in their study were primarily olfactory or gustatory.

In a more recent study Gyoba et al. (2005) instructed participants to indicate the degree of sensory relevance of adjective pairs on 6-point rating scales for 10 sensory modalities, including the perception of pain, warmth, coldness, equilibrium, and kinaesthesia. In general, they obtained high ratings for vision for most pairs of adjectives. They found that adjective pairs that usually span the Evaluation factor in Semantic Differential studies (Osgood et al., 1957), such as pleasant–unpleasant and good–bad tended to get high ratings for multiple modalities. Adjective pairs that span the Activity factor, such as quiet–noisy, static–dynamic, and calm–turbulent received primarily high ratings for the auditory and kinaesthetic modalities.

Adjective pairs that are related to the Potency factor, such as smooth–rough, soft–hard, small–big, and feminine–masculine were rated high for the tactile sense. These outcomes have been partly supported by brain activity measurements while the participants rated stimuli on semantic differential scales (Suzuki et al., 2005). Activation patterns of the temporal and parietal regions of the brain were significantly related to the semantic polarities of Activity and Potency, but no changes in brain activity were related to the ratings on the Evaluation scale.

To determine the extent to which adjective pairs are related to the different sensory modalities, we need to assess the extent to which all modalities are related to the adjectives. In line with the studies performed by Gyoba, Suzuki, and colleagues, we asked participants to rate the relevance of four sensory modalities for each semantic scale on a 5-point scale. Because the research was performed in the context of the evaluation of durable consumer products (see Schifferstein et al., 2010), the taste modality was not included in this study.

2.1. Participants

A convenience sample consisting of colleagues, friends and acquaintances was used, consisting of 57 participants (42 males and 15 females). All participants were native Dutch speakers. One female participant was removed from the sample, because she was unable to smell anything. Ages varied between 20 and 60 years (mean 35.4).

2.2. Procedure

Participants received an email that invited them to go to a specific website. The introduction to the study pointed out that the way in which people experience products depends on the information perceived through the senses. Judging different aspects of the product experience, however, would not necessarily rely on each sensory modality to the same degree. Participants then answered the question ‘Suppose that you would have to rate a product on the following semantic scale, to what extent would the sensory modalities play a role?’ on a 5-point scale, ranging from ‘not at all’ on the left side to ‘very large extent’ on the right side. A set of 39 possible descriptors was derived from previous studies that used the Semantic Differential Method. In addition, 20 scales were derived from a set of unipolar product personality descriptors (Govers, 2004) by creating items that ranged from ‘not at all’ to ‘very’. All original items and their translations can be found in Table 1.

Table 1

Mean sensory relevance ratings for bipolar and unipolar descriptive attributes on a 5-point scale.

English	Dutch	Version	Modality			
			Vision	Audition	Touch	Smell
Evaluation						
Beautiful–ugly	Mooi–lelijk	A	5.0	3.7	2.9	2.2
		B	4.7	3.4	2.7	2.6
Pleasant–unpleasant	Aangenaam–onaangenaam	A	4.5	4.3	4.5	4.5
Agreeable–disagreeable	Prettig–onprettig	B	3.8	3.9	3.9	3.9
Good–bad	Goed–slecht	B	3.6	3.4	3.2	2.8
Friendly–unfriendly	Vriendelijk–onvriendelijk	B	3.9	3.7	2.9	2.1
Attractive–unattractive	Aantrekkelijk–onaantrekkelijk	A	4.7	3.7	3.9	4.0
Seductive–Repulsive	Verleidelijk–afstotelijk	A	4.7	3.7	3.9	4.4
Sympathetic–unsympathetic	Sympathiek–onsympathiek	B	3.8	3.8	2.5	2.4
Inviting–rejecting	Uitnodigend–afwijzend	A	4.3	3.9	3.2	3.1
Activity						
Active–relaxed	Actief–ontspannen	A	4.3	3.7	3.0	2.1
		B	3.9	3.4	3.5	2.3
Stimulating–relaxing	Stimulerend–ontspannend	B	3.4	3.8	3.5	2.9
Excited–calm	Opgewonden–kalm	B	4.1	4.3	3.4	2.6
Fast–slow	Snel–langzaam	B	4.2	3.6	2.8	1.5
Fussy–lethargic	Druk–sloom	A	4.5	3.8	2.1	1.4
Tense–fusty	Gespannen–duf	A	4.1	3.1	3.1	2.0
Flashy–discrete	Flitsend–discreet	A	4.6	3.5	2.3	1.9
Conspicuous–inconspicuous	Opzichtig–onopvallend	B	4.6	3.4	2.0	2.7
Lively–quiet	Levendig–rustig	A	4.5	4.5	3.1	2.5
Potency						
Gentle–tough	Schattig–stoer	A	4.8	3.7	3.2	2.2
		B	4.4	3.4	3.3	2.3
Masculine–feminine	Mannelijk–vrouwelijk	B	4.5	3.7	3.8	3.5
Strong–weak	Sterk–zwak	B	3.7	3.0	3.9	2.3
Careful–brave	Voorzichtig–dapper	A	4.3	3.0	2.6	1.9
Momentous–humble	Gewichtig–nederig	A	4.3	3.3	2.6	1.7

Table 1 (Continued)

English	Dutch	Version	Modality			
			Vision	Audition	Touch	Smell
Impressive–meaningless	Indrukwekkend–nietszeggend	A	4.5	3.9	2.8	2.4
Persistent–accommodating	Vasthoudend–meegaand	A	3.6	3.2	2.9	1.7
Other						
Rough–soft	Ruw–zacht	A	4.2	3.0	5.0	2.0
		B	3.8	2.5	4.7	1.6
Fresh–musty	Fris–muf	A	3.4	1.9	2.6	5.0
		B	3.0	2.0	2.6	4.7
Loud–quiet	Luid–stil	A	2.3	4.9	2.2	1.3
		B	1.9	4.9	2.2	1.4
Mature–youthful	Volwassen–jeugdig	B	4.1	3.4	2.5	2.1
Young–old	Jong–oud	B	4.3	3.1	2.8	3.3
Interesting–boring	Interessant–saai	B	4.3	3.9	3.0	2.5
Funny–serious	Grappig–serieus	B	4.0	4.0	2.2	1.6
Safe–dangerous	Veilig–gevaarlijk	B	4.3	3.9	3.5	3.2
Severe–mild	Streng–mild	B	3.4	3.5	2.7	2.0
Expensive–cheap	Duur–goedkoop	A	4.4	2.7	3.7	2.6
Valuable–worthless	Waardevol–waardeloos	A	4.6	3.6	3.8	2.6
Comprehensible–incomprehensible	Begrijpelijk–onbegrijpelijk	A	4.2	3.1	2.3	1.3
Predictable–unpredictable	Voorspelbaar–onvoorspelbaar	A	4.0	3.5	3.0	2.6
Modern–traditional	Modern–traditioneel	A	4.7	3.4	2.9	2.8
Personality						
Dominant	Dominant	B	4.0	4.1	2.4	2.4
Cute	Schattig	B	4.3	3.2	3.1	2.1
Provocative	Uitdagend	B	4.3	2.9	2.7	2.2
Cheerful	Vrolijk	B	4.3	4.2	2.3	1.7
Pretty	Leuk	B	4.1	3.7	3.0	2.2
Childish	Kinderachtig	B	4.0	3.6	2.6	2.0
Interesting	Interessant	B	4.2	3.9	3.1	2.5
Silly	Dom	B	3.5	3.7	2.0	1.4
Relaxed	Relaxed	B	3.4	3.9	3.4	2.2
Idiosyncratic	Eigenzinnig	B	3.7	3.8	2.6	2.3
Lively	Pittig	A	2.9	1.8	4.1	2.2
Open	Open	A	4.4	3.1	2.9	1.6
Aloof	Afstandelijk	A	4.2	3.1	3.0	2.1
Honest	Eerlijk	A	3.8	3.6	2.7	2.1
Untidy	Slordig	A	4.7	2.8	2.8	1.8
Boring	Saai	A	4.5	3.9	2.7	2.3
Modest	Bescheiden	A	4.0	4.1	2.5	2.1
Easy–going	Vlot	A	4.5	3.8	2.3	2.0
Obtrusive	Opdringerig	A	4.3	4.3	3.0	3.2
Serious	Serieus	A	4.2	4.0	2.7	2.0

To limit the number of questions the participants had to answer, two separate questionnaires were used, each containing about half of the semantic items. To evaluate between-sample reliability, six items were identical in the two versions. The order in which the modalities were presented was different for both surveys. For each semantic item, the sensory relevance was rated for olfaction, touch, audition, and vision (version A) or audition, olfaction, vision, and touch (version B), consecutively. Thirty-three (version A) or 32 (version B) items were rated. Twenty-nine participants filled out version A, 28 filled out version B. The time needed to fill out the questionnaire was approximately 15 min.

2.3. Results

For each item, responses on the 5-point scales were subjected to repeated measures ANOVA with Modality as within-subjects factor. Most items showed biases towards a sensory modality (see Table 1). In contrast to Gyoba et al. (2005), we found that most items that referred to the Activity and Potency dimensions were most strongly related to the visual modality. In accordance with Gyoba et al. (2005), most of the items spanning the Evaluation factor were related to multiple modalities. Only four semantic scales did not show a significant difference between sensory modalities: agreeable–disagreeable ($p = 0.83$), pleasant–unpleasant ($p = 0.55$), stimulating–relaxing ($p = 0.05$), and good–bad ($p = 0.05$). Therefore, the Pleasantness of the product seems to be a sensory neutral product experience. This experience can be assessed by averaging the responses on three items that appear to be sensory neutral (agreeable–disagreeable, pleasant–unpleasant, and good–bad).

To test if age or gender differences between respondents influenced our results, we performed repeated measures ANOVA on the A and B data sets, with Modality and Experience as within-subject factors and Age and Gender as between-subject factors. All effects that included the two demographic factors were not significant (all $p > 0.20$).

3. Study 2: modality importance for sensory product descriptions

Almost all product experiences have associations with more than one sensory modality. The colour of a dress can be 'loud'; the voice of a singer can be 'sweet', and so on. The primary aim of the second study was to determine which sensory descriptors of product experience rely mainly on a single modality and which are primarily multisensory. We included several symbolic and affective experiences in this study as control variables. Based on the results of Study 1, we assumed that symbolic and affective experiences would be mostly multisensory.

Another aim of Study 2 was to look at language differences in modality dominance for three types of product descriptors: sensory, symbolic, and affective. When the meaning of a product is expressed in words, it may be interpreted differently in different languages. Most adjectives that describe product experiences have several meanings, and usually not all these meanings can be translated adequately to another language. For example, the English word 'fresh' has 16 different meanings (Simpson and Weiner, 1989), which can be roughly divided into two groups: (1) new, recent, newly made, recently arrived, retaining its original qualities, not deteriorated or changed by lapse of time; (2) pure, invigorating, refreshing (said especially of air and water), not stale, musty, or vapid. In the Dutch language two different words are used to indicate these two meanings in the case of food products (*vers* for the first meaning and *fris* for the second meaning). When a text is translated from English into Dutch, the translation of the word 'fresh' is likely to have a more restricted meaning and fewer associations in Dutch than in English. We assumed that some descriptors of product experience are culturally specific and bear linguistic associations. To test this assumption, we conducted the study with two groups of respondents: native Dutch speakers and native Russian speakers.

3.1. Participants

The sample consisted of 57 Dutch-speaking students of TU Delft (30 men and 27 women) and 55 Russian-speaking students (27 men and 28 women) of the Higher School of Economics (Moscow, Russia). For the Dutch sample, ages ranged from 21 to 34 years, mean age was 23.5 years. For the Russian sample, ages ranged from 17 to 36, mean age was 20.2 years.

3.2. Procedure

Respondents received paper questionnaire forms at a lecture and filled them in during the break. The questionnaire asked respondents to indicate to what extent different sensory modalities contributed to the evaluation of 34 product properties. The list included *sensory* descriptors: tactile (such as warm, sharp, and rough.); auditory (such as noisy, quiet, and loud); visual (such as colourful, shiny, and clear); olfactory (such as fresh and stale), and gustatory (such as bitter and sweet); *affective* descriptors (such as exciting, funny, and cute); and *symbolic* descriptors (such as complex, modern, and luxurious). Respondents were asked to think of any product (a coffee maker, shoes, cheese, a tooth brush, shampoo, a camera, a chair, a soft drink, a bag, etc.) and to answer the question: "To what extent do the following senses contribute to your evaluation of a product as...?" They assessed the importance of 5 sensory modalities on 5-point scales from 'not important' (1) to 'very important' (5). Because the second study was performed in the context of the evaluation of a set of products that included a soft drink (see Fenko et al., 2009), taste was added to the list of modalities in this study.

There were two types of questionnaires which differed with respect to the order of the sensory modalities. The A-form used the following sequence: audition, olfaction, touch, taste, and vision. The B-form used the sequence: touch, taste, vision, olfaction, and audition. In the Dutch sample, 26 filled out the A-form, and 31 filled out the B-form. In the Russian sample, 27 respondents filled out the A-form, and 28 filled out the B-form. It took participants 10–15 min to fill out the questionnaire.

3.3. Results

We performed repeated measures ANOVA with Descriptor and Modality as within-subjects factors and Language as between-subjects factor. The main effects for Descriptor, Modality and Language were significant: $F(33, 3234) = 39.9$; $p < 0.001$ for Descriptor; $F(4, 392) = 332.8$; $p < 0.001$ for Modality; and $F(1, 98) = 4693.5$; $p < 0.001$ for Language. The Modality \times Language interaction was not significant: $F(4, 392) = 1.5$; $p > 0.2$. The Modality \times Descriptor interaction [$F(132, 12936) = 133.5$; $p < 0.001$] and the Descriptor \times Modality \times Language interaction [$F(132, 12936) = 13.8$, $p < 0.001$] were both significant.

To test if age or gender differences between respondents influenced results, we also performed repeated measures ANOVA with Descriptor and Modality as within-subjects factors and Language, Age and Gender as between-subject factors. The effects of both demographic factors and their interactions with other factors were not significant (all $p > 0.20$).

Overall mean ratings of the 34 experiences showed that vision had the highest rating for 14 descriptors, touch for 10, taste for 4, and audition and olfaction for 3 descriptors each. Symbolic descriptors tended to rate high on all modalities, although all of them demonstrated visual dominance. As predicted, sensory descriptors demonstrated the highest ratings for the corresponding sensory modalities (e.g., touch for 'warm', taste for 'bitter', audition for 'loud', olfaction for 'fresh').

Because the three-way interaction was highly significant, responses for each adjective were subjected to repeated measures ANOVA with Modality as within-subjects factor and Language as between-subjects factor. The effect of Modality was significant for all descriptors ($p < 0.01$). For 24 out of 34 descriptors, the effect of the Modality \times Language interaction was also significant (see Table 2).

Table 2

Mean relevance ratings of modalities for 34 descriptors of product experiences.

Language		Modality				
English	Dutch/Russian	Vision	Audition	Touch	Olfaction	Taste
Sensory descriptors						
Visual						
Colourful**	fleurig	4.7	1.7	1.9	3.7	2.1
	красочный	4.9	1.4	1.6	1.4	1.4
Clean**	schoon	4.6	1.4	3.7	4.3	2.7
	чистый	4.8	2.0	3.9	3.5	2.6
Shiny**	glanzend	4.9	1.5	3.6	1.1	1.1
	яркий	5.0	1.6	1.7	1.6	1.8
Clear	helder	4.7	3.0	2.1	2.1	2.3
	ясный	4.5	2.8	2.2	2.1	1.8
Conspicuous*	opvallend	4.7	3.6	3.5	3.4	3.2
	заметный	4.7	3.7	2.8	3.0	2.6
Beautiful	mooi	4.9	3.2	3.4	2.5	2.1
	красивый	4.8	2.9	2.9	2.3	2.0
Breakable**	breekbaar	4.4	2.9	4.3	1.1	1.2
	хрупкий	4.2	2.1	4.4	1.3	1.5
Quick*	snel	4.7	3.9	2.4	1.5	1.3
	быстрый	4.8	3.3	2.4	1.6	1.4
Tactile						
Warm**	warm	3.3	1.9	4.6	2.1	2.6
	теплый	2.3	1.3	4.6	2.0	3.5
Sharp**	scherp	4.0	2.3	4.4	2.4	3.2
	острый	2.9	1.6	3.4	2.5	4.3
Hard**	hard	3.8	3.0	4.7	1.3	1.9
	твердый	3.3	1.6	4.8	1.3	2.4
Rough**	ruw	4.1	2.2	4.8	1.4	1.8
	грубый	4.1	3.1	4.3	1.9	2.5
Strong*	sterk	4.2	2.5	4.4	2.3	2.5
	прочный	3.9	2.0	4.5	1.3	2.1
Heavy*	zwaar	4.1	2.5	4.6	1.4	1.2
	тяжелый	4.0	2.6	4.3	1.4	1.8
Flexible	flexibel	4.0	2.2	4.6	1.2	1.2
	гибкий	4.1	2.0	4.7	1.3	1.8
Moist	vochtig	3.9	1.7	4.7	2.5	2.8
	влажный	3.8	1.8	4.7	2.9	3.4
Auditory						
Loud*	luid	2.7	4.9	1.6	1.2	1.2
	громкий	2.1	4.8	1.6	1.4	1.3
Quiet**	stil	2.6	4.9	2.1	1.2	1.2
	спокойный	4.1	4.3	3.1	2.4	1.8
Noisy	lawaaierig	3.1	4.9	1.8	1.3	1.2
	шумный	3.1	4.9	1.6	1.3	1.2
Olfactory						
Fresh	fris	3.9	1.8	2.7	4.4	4.1
	свежий	4.1	1.9	3.3	4.6	4.5
Stale**	muf	3.0	1.6	2.2	4.7	3.4
	старый	4.5	2.2	3.7	3.0	2.5
Gustatory						
Bitter**	bitter	2.2	1.2	1.5	3.2	4.8
	горький	1.8	1.3	1.4	2.4	4.9
Sweet*	zoet	3.1	1.4	1.8	4.3	4.9
	сладкий	3.2	1.4	2.1	3.7	4.9
Sour	zuur	2.4	1.1	1.3	3.8	4.9
	кислый	2.8	1.2	1.6	3.5	4.9
Spicy**	kruidig	2.6	1.1	1.6	4.2	4.7
	ароматный	2.2	1.5	1.6	4.6	3.1
Mild**	mild	2.6	1.8	2.4	3.5	4.4
	мягкий	3.4	2.1	4.8	1.8	2.6

Table 2 (Continued)

Language		Modality				
English	Dutch/Russian	Vision	Audition	Touch	Olfaction	Taste
Pure**	puur	3.9	2.4	2.6	3.6	4.2
	строгий	3.9	2.8	2.4	1.7	1.8
Symbolic descriptors						
Luxurious	luxueus	4.7	2.8	3.7	3.1	2.9
	роскошный	4.9	2.9	3.3	3.0	2.9
Complex	complex	4.9	2.9	3.4	1.9	2.1
	сложный	4.6	3.1	3.2	2.1	2.6
Modern**	modern	4.8	2.6	3.2	2.0	1.8
	современный	4.5	3.5	2.6	2.5	2.2
Interesting*	interessant	4.7	3.5	3.9	3.1	3.0
	интересный	4.6	4.0	3.6	3.2	3.2
Affective descriptors						
Exciting**	opwindend	4.3	2.9	3.8	3.3	3.2
	волнующий	3.8	3.1	3.1	3.4	2.6
Funny	grappig	4.6	3.9	3.2	2.2	2.1
	забавный	4.4	3.6	2.8	2.1	2.0
Cute**	schattig	4.7	3.0	3.6	2.1	1.6
	изящный	4.8	2.8	3.5	2.3	2.7

* The effect of Modality \times Language interaction is significant at 0.05 level.

** The effect of Modality \times Language interaction is significant at 0.01 level.

Some of the cultural differences were big enough to affect the importance hierarchy of modalities for particular descriptors. For example, 'spicy' appeared to be mainly a gustatory experience for Dutch respondents (*kruidig*) and olfactory for the Russian sample (*ароматный*). The dominant modality for 'mild' in the Dutch group (*mild*) was also taste, but in the Russian group (*мягкий*) touch was dominant, followed by vision. Olfaction was dominant for 'stale' in the Dutch group (*muf*), but for Russians 'stale' (*старый*) was a visual experience. For Dutch respondents 'pure' (*puur*) was a gustatory experience, while for Russians (*строгий*) it was visual.

These differences encouraged us to perform further analysis on the items. We looked at the response distribution patterns of all the items to evaluate whether the responses were distributed normally within each language group. In the Dutch sample 13 bi-modal distributions (7.6%) were observed by visual inspection: one for olfaction (for colourful), 4 for audition (hard, pure, modern, and cute), 4 for touch (luxurious, pure, modern, and quick), and 4 for taste (sharp, luxurious, clean, and conspicuous). In the Russian sample there were 31 bi-modal distributions (18.2%): 3 for vision (sharp, sweet, and sour); 8 for audition (exciting, luxurious, rough, complex, pure, modern, cute, and clear), 9 for touch (exciting, sharp, quiet, complex, pure, funny, modern, beautiful, and conspicuous), 5 for olfaction (bitter, luxurious, modern, cute, and beautiful), and 6 for taste (warm, hard, luxurious, rough, complex, and clean). The bi-modal distributions suggest that there are sub-groups of participants within each sample that differ in their opinion on modality importance for a particular descriptor.

4. Discussion

4.1. Sensory relevance of adjectives in two languages

We set out to determine the importance of various sensory modalities for different types of descriptors of product experience. As predicted, the affective descriptors (pleasant–unpleasant, stimulating–relaxing, and good–bad) relied equally on all sensory modalities. The symbolic descriptors (complex, luxurious, modern, interesting) were also multisensory, but relied mainly on the visual modality. The latter result corresponds to findings of visual dominance both in the field of product experience (Schifferstein, 2006) and in the area of sensory semantics (Viberg, 1984; Sweetser, 1990). As we predicted, for many sensory descriptors the corresponding sensory modality was dominant (e.g., audition for noisy, taste for bitter, touch for hard, vision for shiny). Nevertheless, we also found several sensory descriptors for which more than one modality was important. For example, fresh is mostly an olfactory adjective, but it has also high importance ratings for taste, vision, and touch in both the Dutch and the Russian sample. Most tactile adjectives (rough, heavy, moist, warm, flexible) also have high importance ratings for the visual modality. This agrees to Williams' (1976) suggestion that touch is the main source domain and vision is the main target domain for the metaphorical transfer of meaning in sensory adjectives.

Significant language differences were found for various sensory descriptions (such as colourful, rough, quiet, spicy, and stale). The possible explanation for this result is that semantic connotations for sensory adjectives differ considerably between the languages. For instance, *scherp* in Dutch and *острый* in Russian are both equivalents to the English word 'sharp', of which the literal meaning is tactile (having a keen edge or point). In English and Dutch it is also possible to characterize a

high-pitch sound or pungent food as sharp. In Russian another word is used for characterizing a sharp sound (*резкий*), so audition has a low importance rating for the experience of sharp (1.6). On the other hand, gustatory associations with sharpness are even stronger for the Russian sample than tactile associations (importance rating 4.3 for taste vs. 3.4 for touch). This can be due to the fact that for the Russians associations were stronger with food than with tools like knives or scissors.

Vice versa, for Dutch respondents gustatory associations with 'pure' (*puur*) were as strong as the visual associations (importance rating 4.2 for taste vs. 3.9 for vision). Although the visual rating of 'pure' (*чистый*) was identical for the Russian sample (3.9), taste had little importance for pure (1.8). The same was true for 'mild'. The Dutch word *mild* showed the highest importance rating for taste (4.4), but the Russian equivalent *мягкий* was mostly tactile (4.8). Apparently, *mild* in Dutch is similar to 'mild' in English when applied to food: not sharp, strong, or hot in flavour, not pungent, while *мягкий* in Russian is more synonymous to 'soft' and refers mostly to tactile properties.

When participants assess particular sensory modalities as important for judging a specific product attribute, they probably imagine a product that has this attribute. These products may be considered as 'prototypical' in a sense that they first come to mind in association with a certain attribute (Rosch, 1978; Mervis and Rosch, 1981). The fact that the assessment of sensory modalities varies between languages may suggest that prototypical products may also vary cross-linguistically. For example, knives and scissors may be prototypical 'sharp' products for the Dutch, while spicy foods may be prototypical for the Russians. Therefore, the language differences found in the present study may be related to the categorization processes which were shown to differ between speakers of different languages (Schmitt and Zhang, 1998; Zhang and Schmitt, 1998). Future research can evaluate whether prototypical products for specific adjectives differ between languages.

The language differences we found in the present study might have an effect on how people experience products. According to the linguistic relativity proposal (Whorf, 1956), speakers of different languages perceive and conceive the world differently. Language may act as a filter through which people view reality in the process of perception, categorization and the interpretation of information (Hunt and Agnoli, 1991). Differences in linguistic coding have been shown to correlate with differences in non-linguistic conceptual coding (Levinson, 2003; Majid et al., 2004; Levinson and Wilkins, 2006), suggesting that linguistic distinctions affect how we think (see also Lucy, 1992; Boroditsky, 2001). Lexical differences can impact perception (Kay and Kempton, 1984; Davidoff et al., 1999) and cognition (Gordon, 2004). Further research is needed to evaluate whether differences in product experiences exist between people speaking different languages, and whether any such differences can be traced back to differences in sensory adjectives and sensory metaphors in different languages.

Some authors argue that each culture has its own mental frames (Hong et al., 2000), which are learned and used in conjunction with that culture's language (Foucault, 1972). As a result, words in two different languages that may seem to be exact translations of each other are likely to have different sets of culture-specific connotations (Kroll and De Groot, 1997), reflecting the differences in cultural frame content.

Because the interpretations of words vary among cultures and individuals, it is difficult to standardize verbal communication with research participants from different cultures. Incompatibility of testing methods creates methodological problems for interpreting cross-cultural differences. It is difficult to reach item equivalence, to make sure that the instruments used in the research are similar, even with the most accurate translation and back translation (Brislin, 1980).

In cross-cultural studies, it is extremely difficult to separate a cultural effect from a language effect, because people from different cultures tend to speak different languages. This is why people who speak two languages (bilinguals) and people who internalized the values, beliefs, and norms of two cultures (biculturals) have become the focus of research in psycholinguistics, anthropology and consumer studies. Biculturals often report feeling "like a different person" when they speak a different language (LaFromboise et al., 1993). This suggests that biculturals may possess two different culture-specific mental frames for a single word in two different languages (translation-equivalent words) (e.g., Hong et al., 2000). Using bicultural bilingual participants can be a useful option in the future studies of cross-cultural and language differences in product experience.

4.2. Cognitive and sensory modes of information processing

In this study we found more language differences for sensory descriptors of product experiences than for symbolic descriptors. This result may be related to the differences between cognitive and sensory modes of information processing (Hirschman, 1984; Pearson, 1970). These different modes initiate different mental and physical activities. Cognitive modes of information processing refer to logical, rational, sequential thought processes and verbal modes of information processing in contrast to holistic, gestalt, and visual modes of information processing (Childers et al., 1985). Cognitive experiences are related to the need for being adaptively oriented to the environment and for achieving a sense of meaning, while sensory and affective experiences are related to the need to achieve a feeling of satisfaction and to attain emotional goals (McGuire, 1976). We can assume that logical thinking and rationality is universal across cultures, while sensory experiences and emotional goals will vary not only between social and cultural groups, but also between individuals. The latter suggestion was supported by our finding that modality ratings for some sensory experiences demonstrated bi-normal distribution patterns, even within a relatively uniform group of students of the same age and education level. Additional research is needed into the associations people have with particular descriptions in various situations, in order to specify the exact meaning of these adjectives for different products and different user groups.

5. Conclusions

This research investigated the importance of sensory modalities for various descriptors of product experience. The results showed that only for the affective descriptors of product experience (pleasant–unpleasant, good–bad) all modalities were about equally important. Symbolic descriptors (such as modern, expensive, or feminine) generally convey the social or personal meaning of products. These descriptors tended to be multisensory, but most of them demonstrated visual dominance. Sensory descriptors (such as colourful, loud, or soft) reflect the perception of sensory information. In addition, sensory meaning may transfer to other domains of experience. We found that sensory descriptors of product experience showed significant language differences. The latter result can be explained by the fact that metaphorical meanings of sensory descriptors differ between languages.

Further research with a more broad variety of languages is needed to investigate the differences in sensory metaphors. In cognitive linguistics, sensory metaphors (such as KNOWLEDGE IS VISION or UNDERSTANDING IS GRASPING) are viewed as conceptual metaphors which are fundamental to language, thought, and experience (Lakoff and Johnson, 1980, 1999; Sweetser, 1990). Whether such metaphors are universal or vary between languages and cultures is a question of significant importance for current cognitive linguistic theory. Most cognitive linguists assume that conceptual metaphors are explicit abstract representations of embodied cognitive structures. According to Lakoff and Johnson (1999), conceptual metaphors (such as POSITIVE IS UP, NEGATIVE IS DOWN) could be established as people implicitly learn associations between physical experiences and emotional states that typically co-occur. Kövecses (2005) distinguishes between universal metaphors that are rooted in the universal bodily experience and conventional metaphors that vary across cultural, social, regional, style, developmental and other dimensions. Some scholars suggest that conceptual metaphors are not merely representative of universal body experience, but are tied to specific socio-cultural cognition (Kimmel, 2006; Zlatev, 2006). Metaphors could be learned from patterns in language and culture (Ibarretxe-Antuñano, 2008); they are not necessarily “embodied” (Boroditsky, 2000; Gentner et al., 2001). Even if direct bodily experience is necessary on the timescale of biological or cultural/linguistic evolution, it may not be necessary on the timescale of the conceptual development of an individual (Tomasello, 2003; Vygotzky, 1986). Further research into the cultural differences in sensory metaphors might help to resolve this theoretical argument.

As concerns practical implications, it should be noted that sensory adjectives are frequently used in advertising to describe sensory and symbolic properties of products (Ruiz, 2006). Since most sensory adjectives have additional metaphorical meanings which can differ between the languages, it is important for advertisers who want to use the same slogans and product descriptions in countries with different languages, to be aware of the polysemy of sensory adjectives and cross-cultural differences in their metaphorical meanings.

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